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ANHYDRITE

Anhydrite (CaSO_4) is one of two naturally occurring calcium sulfate compounds. It is composed of CaO (41.2 percent) and SO_3 (58.8 percent); and it occurs as crystalline masses, usually granular but sometimes fibrous, that are white to pale shades of gray, blue, or red. With a hardness of 3 to 3.5, and specific gravity of 2.89 to 2.98, it may be confused with limestone or dolomite in the field. From limestone it may be distinguished by lack of effervescence when it is tested with dilute hydrochloric acid. Under the petrographic microscope, anhydrite may be identified by its rectangular cleavage, moderate relief, and second to third order birefringence.

Anhydrite is closely associated with gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$), the second of the natural calcium sulfate compounds. Much evidence indicates that gypsum is the stable phase of calcium sulfate at the surface of the ground and that at depths of more than a few hundred feet, calcium sulfate occurs as anhydrite. In most gypsum deposits that have been developed in depth, gypsum grades downward into anhydrite.

In a majority of deposits the calcium sulfate minerals occur interbedded with limestone, shale, sandstone, or salt. Less commonly they form coarsely crystalline bodies associated with schist and marble. Anhydrite and gypsum form the cap rock of the salt domes that occur in the Gulf coast region of the United States. Some hydrothermal copper deposits contain gypsum or anhydrite as a gangue mineral.

Except for some minor occurrences, the calcium sulfate minerals are believed to be chemical precipitates that have formed by the evaporation of saline solutions. Whether calcium sulfate precipitates as gypsum or as anhydrite has not been conclusively determined. As pointed out above, in most gypsum deposits the gypsum changes to anhydrite at depth; and it has been shown that the gypsum was formed from anhydrite by slowly taking up water. Laboratory experiments have shown, however, that at

temperatures likely to occur in nature, at least some of the calcium sulfate of an evaporating solution precipitates as gypsum. Presumably any gypsum originally present would be changed to anhydrite upon deep burial, probably as the result of heat.

In California abundant anhydrite has been found only in the extensively developed gypsum workings of the United States Gypsum Company in the Fish Creek Mountains, Imperial County, and in the Little Maria Mountains of eastern Riverside County. Other gypsum deposits where further exploration at depth might reasonably be expected to find anhydrite are the Palen Mountains and Riverside Mountains deposits, Riverside County, Clark Mountains deposit, San Bernardino County, and Quatal Canyon deposit, Ventura County.

In the Fish Creek Mountains, Imperial County, anhydrite has not been found at the surface, but it occurs abundantly in the United States Gypsum Company's quarry about 120 feet vertically below the crest of the face. This quarry, which is about 30 miles west of Brawley and near the western boundary of Imperial County, supplies crude gypsum for the United States Gypsum Company's calcining plant at Plaster City. The gypsum beds, which consist of at least 100 feet of nearly pure, massive gypsum,



Specimen of anhydrite altering to gypsum. (From Gypsum in California: Calif.Div.Mines Bull.163.)